

of a discussion on the zoological system as commonly taught, Prof. H. E. Ziegler emphasises the view that the rhizopod and flagellate animalcules, together with the Sporozoa, form an allied assemblage, while the ciliated animalcules, both as regards the nature of the nucleus and the mode of reproduction, are altogether different. In a fourth important communication Dr. Bresslau amplifies and illustrates his discovery that the marsupium of the marsupials, in place of being a simple organ, is really formed by the amalgamation of a number of small pouches. These pouchlets, which at first form solid ring-like growths of the epidermis, soon begin to degenerate, and are merged in the wall of the marsupium. R. L.

The Optical Dictionary. Edited by Charles Hyatt-Woolf, F.R.P.S. Pp. x+77. (London: The Gutenberg Press.) Price 4s. net.

This is an optical and ophthalmological glossary of English terms, symbols, and abbreviations, together with the English equivalents of some French and German terms arranged alphabetically. The meanings are, as a rule, very clearly given, and the book should prove of use to students (especially medical students) who suddenly come upon an unfamiliar term in the course of their general reading. Of course, it must be understood that it is practically impossible to explain properly any scientific term in a line or two, and this is all that is attempted; the meanings given must therefore in most cases be somewhat unsatisfactory. But the book will doubtless succeed in its aim, especially in the translation of foreign terms. As regards accuracy—the *sine qua non* of a dictionary—we only notice a very few actual errors, e.g. *dioptrically* does not mean *by reflection*, and in the definition of *numerical aperture* the words *refractive index of the medium in which the object is immersed* scarcely indicate that the medium must extend into contact with the objective. *Underlant* is apparently a misprint for *undulant*, and one-third of p. 70 has got into its wrong place.

But these are not very important blemishes, and we cordially recommend the book to those whom it may concern.

Practical Professional Photography. Vols. i. and ii. By C. H. Hewitt. Pp. 126 and 114. (London: Iliffe and Sons, Ltd., 1904.) Price 1s. net each.

These two volumes form a very useful addition to the *Photography* bookshelf series, of which they form Nos. 17 and 18. Although the author does not profess to go into any great detail, he gives an excellent account of the necessary requirements of the professional photographer, from the choice of business premises, the handling of customers, book-keeping, &c., down to the packing up of the finished pictures and their dispatch. The chapters on portraiture, composition, and lighting are especially satisfactory, and many a valuable hint is contained therein.

A great number of illustrations accompany the text, and serve the useful purpose of illustrating the author's remarks on many lines of work.

Solutions of the Exercises in Godfrey and Siddons's Elementary Geometry. By E. A. Price. Pp. 172. (Cambridge: The University Press, 1904.) Price 5s. net.

This book will be found very useful to all, both pupils and teachers, who use the well known work of Messrs. Godfrey and Siddons. The solutions, 1836 in number, contain not only the deductive, but the drawing exercises, the figures being all such as the pupil is required to construct. We cannot refrain from pleading for a better figure of a hyperbola than that given on p. 143, which a trained eye rejects at once, although it is not essential to the pupil's work.

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LETTERS TO THE EDITOR.

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Average Number of Kinsfolk in Each Degree.

MAY I ask you to insert yet another brief communication on the above subject, because private correspondence shows that paradoxical opinions are not yet wholly dispelled? The clearest way of expressing statistical problems is the familiar method of black and white balls, which I will now adopt.

Plunge both hands into a dark bag partly filled with black and white balls, equal in number, and well mixed. Grasp a handful in the right hand, to represent a family of boys and girls. Out of this unseen handful extract one ball, still unseen, with the left hand. There will be *on the average* of many similar experiments, as many white as black balls, *both* in the original and in the residual handful, because the extracted ball will be as often white as black. Using my previous notation, let the number of balls in the original handful be $2d$. Consequently the number in the residual handful will be $2d-1$, and the average number in it either of white or of black balls will be half as many, or $d-\frac{1}{2}$. It makes no difference to the average result whether the hitherto unseen ball in the left hand proves to be white or black. In other words, it makes no difference in the estimate of the average number of sisters or of brothers whether the individual from whom they are reckoned be a boy or a girl; it is in both cases $d-\frac{1}{2}$. The reckoning may proceed from one member of each family taken at random, or from all its members taken in turn; the resultant average comes out the same.

This, briefly, is my problem.

FRANCIS GALTON.

On the State in which Helium Exists in Minerals.

IN 1898 I published in the *Proceedings* of the Royal Society the results of some experiments on the evolution of gases from minerals on heating them. I succeeded in proving that the hydrogen and carbon monoxide in the gases could be accounted for quantitatively by the reduction of water vapour and carbon dioxide by ferrous oxide, or by similar substances, and that, except in cases in which cavities could be proved to exist, the evolution of a gas from a mineral implied chemical change at the moment of heating. In the cases in which helium was evolved on heating a mineral, I pointed out that by the action of heat it is possible to obtain only half the helium, though the evolution of this gas never really ceases, but only becomes very slow. This I took to be evidence of the existence of a chemical compound of helium with some constituent of the mineral.

Recently (*Trans. Roy. Dublin Soc.*, 1904) Mr. Moss has shown that by grinding pitchblende *in vacuo* helium is evolved, and considers this result as certain evidence of the existence of the gas in the free state in cavities. Since, however, helium is evolved, though slowly, from the crushed mineral at a temperature not above 300° C., the liberation of the gas in Mr. Moss's experiment may be attributed to local heating set up in the process of grinding.

In view of recent discoveries it appears to me that both of us have been on the wrong track in looking for an explanation of the phenomenon. As Sir William Ramsay and Mr. Soddy have shown, the presence of helium in the minerals may have resulted from the decomposition of radioactive matter, formerly present in them. Recently Dr. Jaquerod, of Geneva (*Comptes rendus*, 1904, No. 20, p. 789), has found that when helium is heated in a quartz bulb to a temperature above 500° C. the gas passes out through the quartz with a velocity which increases with the temperature. At 1100°, in a comparatively short time the pressure in the bulb fell considerably below that of the atmosphere. Hydrogen appeared to behave similarly.

This experiment shows that quartz, and probably substances of the nature of the minerals we are considering, though impermeable to helium at low temperatures, become permeable at moderately high temperatures, and furnishes us with a solution of the second part of our problem.

I think that we are now justified in assuming that the helium, a product of radio-active change, is present in the minerals in a state of supersaturated solid solution; that the mineral substance being impermeable to the gas at ordinary temperatures, the velocity with which equilibrium is established between the helium in solution and the helium in the gaseous phase is infinitely small, but increases very rapidly with rise of temperature; that as the solubility of helium in the mineral substance is probably very small, the mineral cannot be made to re-absorb the gas. Grinding even to an impalpable powder, if unaccompanied by local heating, should result in the evolution of minute quantities of helium only.

I may point out in conclusion that the "deflagration" which takes place when "fergusonite" is heated, and was taken by Sir Wm. Ramsay and myself to indicate the presence of a chemical compound of helium, also takes place in the case of some minerals which contain no helium.

University College, Bristol.

MORRIS W. TRAVERS.

The Pollination of Exotic Flowers.

IN connection with Prof. Groom's article on the pollination of exotic flowers (November 10, 1904, p. 26) the following notes may be of interest. The inflorescence of *Marcgravia Umbellata* is described in Schimper's "Plant Geography," where Belt's description is quoted from the "Naturalist in Nicaragua." The plant is common here, climbing to the summit of the forest trees, and is frequently visited by humming birds. The bird settles on the top of the flowers and inserts its long curved beak into the pitchers below to suck the sweet juice which they contain. I have not seen insects visiting the flowers, neither have I found them in the pitchers, and conclude that the birds are attracted by the sweet juice itself rather than by insects in search of it as Belt suggests.

Flowers with strong scent and brush-like stamens are very common, and one of them, the *Pois Doux* (*Inga laurina*), is surrounded when in blossom by a motley crowd of bees, large beetles, and insects of every description, as well as by humming birds of several species. The latter certainly visit very different plants, but are most familiar hovering round the banana flowers, sucking the drops of sweet liquid continually oozing from them.

Flowers like the *Pois Doux* are easily destroyed by heavy rain, and blossom only for a short period. A large number of others are provided with horned stamens, with barren anthers or anther lobes. May not this be a protection against loss of pollen by rain and wind, it being kept in a sheltered situation, and only set free when an alighting insect moves the stamens? It would be interesting to observe how far the abundance of flowers with horned stamens is correlated with heavy rainfall and constant wind.

Dominica, December 13, 1904.

ELLA M. BRYANT.

Reversal of Charge in Induction Machines.

I HAVE tried Mr. G. W. Walker's experiment with a small Wimshurst, with 8" plates, and find that the reversal he mentions generally takes place, but not always. In my case, however, the machine is made so as to excite either way, and the reversal will not take place unless excitation has occurred while the motion is reversed.

R. LANGTON COLE.

Sutton, Surrey, January 6.

EVIL SPIRITS AS A CAUSE OF SICKNESS IN BABYLONIA.¹

IN a former number of NATURE (vol. lxi., p. 26) the attention of our readers was directed to the appearance of the first volume of a work which Mr. Campbell Thompson, of the British Museum, was devoting to the consideration of the important function which devils and evil spirits were believed to play in the production of disease by the early inhabitants of Babylonia.

¹ "The Devils and Evil Spirits of Babylonia." By R. Campbell Thompson. Vol. ii. Pp. liv+179. (London: Luzac and Co., 1904.) Price 12s. 6d. net.

It was impossible at that time to state the final conclusions at which Mr. Thompson had arrived, for the publication of his work was not completed; but now that we have the second volume in our hands our readers are in a position to judge for themselves of the character and importance of the results, which have now been clothed in the dress of a modern language for the first time. The sources of such results, we need hardly say, are the terra-cotta tablets of the royal library at Nineveh, now preserved in the British Museum, and after a careful examination of Mr. Thompson's volumes we are able to say that the translator has done his best to reproduce the meaning of the documents which he places before us without unnecessary comments or theories.

It must be said at the outset that we do not regard Mr. Thompson's work as final in all particulars, for in respect of many Assyrian texts this work is the *editio princeps*; but none can fail to be pleased with the manifest honesty of the translations, which quite justifies us in overlooking the baldness and crudity of expression which sometimes characterise them. In studies of this kind we want the texts and the best rendering of them possible, but the most important point of all is that the editor should not read meanings into the words of his texts or twist them to suit preconceived notions. It goes without saying that Mr. Thompson's translations will not be accepted by other labourers in his field without reservation. Indeed, we may note in passing that M. Fossey has already animadverted upon them in the *Recueil de Travaux*, in the *Revue Critique*, and in the part of the *Journal Asiatique* just issued. It is no part of our duty here to attempt to vindicate Mr. Thompson's renderings or to belittle M. Fossey's knowledge of the science of ancient magic, but it must in common fairness be stated that the latter *savant* is not skilled in dealing with cuneiform documents except through the medium of the copies of other scholars who have been trained in making transcripts direct from the original tablets, and the mere fact that he condemns Mr. Thompson's derivations from the Syriac proves that he does not comprehend the importance of one northern Semitic dialect in helping to explain another. On the other hand, Mr. Thompson has spent some years in the task of copying the various classes of tablets which he is now editing and translating, and though some may admire M. Fossey's tempting renderings, and prefer them to those of Mr. Thompson, it should be remembered that the translations set forth in the volume before us are those of the skilled workman who is working at his trade, whilst those of M. Fossey are the product of a student of magic and religion in general.

The groups of tablets published by Mr. Thompson are five in number. The first are inscribed with exorcisms and spells which are directed against the disease of ague or fever; the second contain charms and incantations which were intended to do away with headache; the third deal with a series of diseases of an internal character, but it cannot at present be said exactly what those diseases were; the fourth are inscribed with texts written with the view of destroying the "taboo" to which, it seems, man was thought to be peculiarly liable; and the fifth supply descriptions of supernatural beings, among whom may be mentioned a creature who was half woman and half snake. Mr. Thompson identifies her with the goddess Nin-tu, who was the Babylonian equivalent of the Egyptian goddesses Hathor, Isis, Mer-sekert, &c., and the Virgin Mary among Oriental Christian peoples. Like each of those goddesses she was a form of the World-mother, or chief Mother-goddess who plays such an important part in many mythologies. By way of supplement, Mr. Thompson has added the